

REMARKS

Entry of the foregoing amendment and favorable reconsideration of the subject application is respectfully requested in view of the following comments.

Claims 4-7 are currently pending in the subject application. By the foregoing amendment, claims 4 and 6 have been amended and claim 7 has been cancelled. Accordingly, claims 4-6 are herewith presented for the examiner's consideration.

Applicants respectfully submit that the cancellation of claim 7 renders any rejections thereof moot.

Claim 4 has been amended to more clearly specify the structure of the ceramic product and to specify the depth to which the uniformly distributed dislocation structure extends within the ceramic product and to recite the more preferred range of such dislocation density. These limitations are fully supported in the specification as filed, notably at page 15, lines 26-31.

Claims 5 and 6 have been amended to clarify that the uniformly distributed linear dislocation structure is in the sub-surface regions of the ceramic product and to specify that the uniformly distributed linear dislocation structure is formed without an annealing step. This feature is specifically disclosed in the specification as filed, notably in the "Field of the Invention" as well as elsewhere in the specification.

No new matter has been entered by this amendment.

**Rejection of Claims 4-7 Under 35 U.S.C. 102(a or e) or, in the
Alternative, Under 35 U.S.C. 103(a)**

Claims 4-7 have been rejected under 35 U.S.C. 102(a or e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Saka, et al., (U.S. 6,884,386, filed 9-20-01 or WO02/24605, publication date 3-28-02. The Office Action states:

"Saka et al teach a surface toughened body by shot blasting.

It is well settled that when a claimed composition appears to be substantially the same as a composition disclosed in the prior art, the burden is properly upon the applicant to prove by way of tangible evidence that the prior art composition does not necessarily possess characteristics attributed to the CLAIMED composition. In re Spada, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Circ. 1990); In re Fitzgerald, 619 F.2d 67, 205 USPQ 594 (CCPA 1980); In re Swinehart, 439 F.2d 2109, 169 USPQ 226 (CCPA 1971).

In product-by-process claims, "once a product appearing to be substantially identical is found and a 35 U.S.C. 102/103 rejection [is] made, the burden shifts to the applicant to show an unobvious difference." MPEP 2113. This rejection under 35 U.S.C. 102/103 is proper because the "patentability of a product does not depend on its method of production." In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985)."

Applicants respectfully traverse the rejection under 35 U.S.C. 102(a or e) on the ground that the reference does not teach each and every claimed limitation of the amended claims.

The Federal Circuit has held that anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of

California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Those elements must either be inherent or expressly disclosed and must be arranged as in the claim. In re Bond, 15 USPQ2d 1566 (Fed. Cir. 1990). Additionally, there must be no difference between the claimed invention and the reference disclosed, as viewed by a person of ordinary skill in the art. Richardson v. Suzuki Motor Co., 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The prior art reference must also be enabling, thereby placing the allegedly disclosed matter in the possession of the public. In re Brown, 329 F.2d 1006, 1011, 241 USPQ 245, 249 (C.C.P.A. 1964). In order to accomplish this, the reference must be so particular and definite that from it alone, without experiment or the exertion of his own inventive skill, any person versed in the art to which it pertains could construct and use it. Id. at 250.

Finally, the Federal Circuit has made it clear that a negative pregnant is not enough to show anticipation. Rowe v. Dror, 112 F.3d 473, 42 USPQ2d 1550 (Fed. Cir. 1997). Thus, where a reference does not explicitly describe anything inconsistent with a claimed use, if that reference nevertheless fails to make an affirmative suggestion of the claimed limitation, that reference cannot anticipate the claimed use. Id.

Even if the prior art device performs all the functions recited in the claim, the prior art cannot anticipate the claim if there is a structural difference. In re Robertson, 49 USPQ2d 1949, 1951 (Fed. Cir. 1999).

In the present instance, there is a significant structural difference between the ceramic product of the present invention and that of the cited reference and Applicants have pointed out this difference in the specification of the present invention.

The reference cited by the examiner is identified by the Applicants in the present specification as prior art, specifically at page 2, lines 13-18 where it is disclosed that:

"Hiroyasu Saka, Won-Jin Moon, Shouji Uchimura and Hideki Morimitsu proposed an improved technique which carried out the process before the annealing treatment using technique of plastic working (shot blasting treatment) for said initial technology (WO02/24605 A1, especially refer to Example in pages 8 to 19, Document 2)."

Prior thereto, Applicants discuss their earlier research in which a dislocation sub-boundary is introduced simultaneously with annealing at between $0.5T_M$ and T_M where T_M is the absolute temperature of the melting point of the ceramic.

Thus, the prior art of Saka, et al., which includes inventors and at least one assignee common to the present application, is directed to a method of toughening and modifying ceramic which requires both plastic working and annealing to produce a final product. As disclosed by the reference, the surface of a sintered body is shot blasted to plastically deform the crystal structure and apply residual stress, followed by heat treatment to recrystallize fine cracks. The resulting structure of the ceramic product of Saka, et al., is shown in the present application in Fig. 3, and is characterized by a dislocation

structure in the form of a network of dislocated cells which is then stabilized by the annealing step.

In contrast, the present application is directed to a surface toughened ceramic product which is produced by plastic working only and is characterized by a uniformly distributed linear dislocation structure in the sub-surface regions which is clearly shown in Fig. 2 of the present application. This linear dislocation structure is uniform to a depth of 30 μ m from the surface and has a density in the range of 1×10^8 to 9×10^{13} cm⁻².

The structural difference between the ceramic product of the present application and that of the Saka, et al. reference is specifically discussed in the present application at page 17, line 17 to page 18, line 2 (paragraph 42 in Pub. 2006/0293165).

"In Fig.2, especially from enlarged drawing (B), in the sub-surface regions of specimen treated by the present invention, linear dislocation structure that distributed homogeneously caused by the fact that the plastic deformation caused homogeneously can be observed. In the drawing, black linear line is dislocation, and at the surface of the product, block of black part which is formed by accumulating dislocation can be observed. In Fig.2, whity part can be observed at the surface of product, however, this is caused by not meeting of observation condition because the crystal of whity part is slightly rotated against the crystal of black part, and by adjusting the observation condition said part becomes black and the existing of dislocation can be confirmed. In the meanwhile, according to Fig.3 of the transmission electron microscope picture of ceramics product to be treated using conventional technique, dislocation structure becomes a net work shape dislocated cell structure, which is a stabilized arrangement, by annealing treatment after plastic working. In this Figure, dislocation is accumulated at the black net work part and consequently dislocation density becomes high, and in whity part is the range where dislocation does not exist. Since dislocation does not exist at

this whity part, it does not change color to black, even if the observation condition is changed. Thus, the structure obtained by the method for surface toughening of the present invention is remarkably different from the structure obtained by conventional technique."

Accordingly, as the present application clearly describes, the claimed ceramic product exhibits an homogenously distributed linear dislocation structure which is produced by plastic deformation using fine particles of abrasive having an average particle size of 0.1 μ m to 250 μ m, a convexly curved surface and a Vickers hardness of 500 or more. In addition, the claimed ceramic product is the result of plastic deformation only, without annealing, where the plastic working is carried out by shot blasting the ceramic with the abrasive particles at a pressure of 0.1 to .05MPa, a shot blasting speed of 20m/sec to 250m/sec and a shot blasting time of 0.1sec/cm² to 60sec/cm².

In contrast, the cited reference teaches a ceramic product having a non-homogenously distributed, non-linear dislocation structure obtained by shot blasting followed by heat treatment at a temperature of from 1,000°C to 1,600°C. Applicants respectfully point out that nothing in the cited reference teaches or suggests the production of a toughened ceramic product by plastic deformation or heat treatment alone. The teaching is specific to a toughened ceramic product produced by a combination of plastic deformation and heat treatment in that order. As shown and described in the present application, the combined plastic deformation and heat treatment of the reference results

in a ceramic structure having a different internal dislocation structure than that of the present invention.

In view of the foregoing, Applicants respectfully submit that the product of the present invention and the product of the reference are structurally different and this has been demonstrated by tangible evidence of record. Applicants therefore respectfully submit that the present invention is not disclosed by the Saka, et al., reference and is not anticipated thereby. Accordingly, the rejection under 35 U.S.C. 102(a or e) should be withdrawn.

With regard to the alternative rejection under 35 U.S.C. 103(a), Applicants respectfully traverse the rejection on the ground that the reference teaches away from the present invention.

As previously noted, the Federal Circuit has held that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991; In re Fine, 5 USPQ2d 1596, 1596 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The examiner bears

the initial burden of providing some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

The present application claims a ceramic product having a uniformly distributed linear dislocation structure in the sub-surface regions within a depth of 30 μ m from the surface and a dislocation density of from 1×10^8 to 9×10^{13} cm⁻². This structure is obtained by plastic working of the ceramic structure without annealing where the plastic working is carried out by shot blasting the ceramic with the abrasive particles at a pressure of 0.1 to .05MPa, a shot blasting speed of 20m/sec to 250m/sec and a shot blasting time of 0.1sec/cm² to 60sec/cm².

As pointed out in connection with the rejection under 35 U.S.C. 102(a or e), the reference teaches a ceramic product having a non-homogenously distributed, non-linear dislocation structure obtained by shot blasting followed by heat treatment at a temperature of from 1,000°C to 1,600°C. Applicants respectfully point out that nothing in the cited reference teaches or suggests the production of a toughened ceramic product by plastic deformation or heat treatment alone. The teaching of the reference is specific to a toughened ceramic product produced by a combination of plastic deformation and heat treatment in that order. As shown and described in the present application, the combined plastic deformation and heat treatment of the reference results in a ceramic structure having a different internal structure than that of the present invention.

Absent some suggestion in the reference to eliminate the annealing step and that elimination of that step would yield the uniformly distributed linear dislocation structure of the present invention, Applicants respectfully submit that there is no motivation which would urge one of ordinary skill in the art to depart from that teaching and to modify the reference with any reasonable expectation of success.

In the absence of any such suggestion, Applicants respectfully submit that a *prima facie* case of obviousness of the present invention over the reference to Saka, et al., has not been made and that the rejection of claims 4-6, as amended herein, is without support and should be withdrawn.

Rejection of Claim 4 Under 35 U.S.C. 102(b)

Claim 4 has been rejected under 35 U.S.C. 102(b) as being anticipated by Japanese document 07-157362. The Office Action states:

"The Japanese document teaches a sintered material having a dislocation structure of 1×10^4 to $9 \times 10^{14} \text{cm}^{-2}$, see table on page 4. The claims are considered anticipated."

Applicants respectfully traverse the rejection on the ground that the reference does not teach each and every claimed limitation of the amended claims.

As applicants have previously noted, the Federal Circuit has held that anticipation requires that each and every element of the claimed invention be disclosed in a single prior art

reference. Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Those elements must either be inherent or expressly disclosed and must be arranged as in the claim. In re Bond, 15 USPQ2d 1566 (Fed. Cir. 1990). Additionally, there must be no difference between the claimed invention and the reference disclosed, as viewed by a person of ordinary skill in the art. Richardson v. Suzuki Motor Co., 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The prior art reference must also be enabling, thereby placing the allegedly disclosed matter in the possession of the public. In re Brown, 329 F.2d 1006, 1011, 241 USPQ 245, 249 (C.C.P.A. 1964). In order to accomplish this, the reference must be so particular and definite that from it alone, without experiment or the exertion of his own inventive skill, any person versed in the art to which it pertains could construct and use it. Id. at 250.

Finally, the Federal Circuit has made it clear that a negative pregnant is not enough to show anticipation. Rowe v. Dror, 112 F.3d 473, 42 USPQ2d 1550 (Fed. Cir. 1997). Thus, where a reference does not explicitly describe anything inconsistent with a claimed use, if that reference nevertheless fails to make an affirmative suggestion of the claimed limitation, that reference cannot anticipate the claimed use. Id.

Even if the prior art device performs all the functions recited in the claim, the prior art cannot anticipate the claim if there is a structural difference. In re Robertson, 49 USPQ2d

1949, 1951 (Fed. Cir. 1999).

Japanese document 07-157362 discloses a dislocation density of 1×10^4 to $9 \times 10^{14} \text{cm}^{-2}$ not a "dislocation structure" as suggested by the examiner. The dislocation density is a measure of how many dislocations are present in a quantity of a material, i.e., number of dislocations per unit volume. In contrast, the dislocation structure is the actual structure of the dislocations within the material. Applicants respectfully submit that the dislocation density is not an indicator of the dislocation structure and that different dislocation structures may have the same or similar dislocation density.

Applicants respectfully point out that, although the reference discloses a dislocation density of 1×10^4 to $9 \times 10^{14} \text{cm}^{-2}$, it fails to teach or suggest a dislocation structure corresponding to that claimed in the present invention, i.e, "a uniformly distributed linear dislocation structure in the sub-surface regions within depth direction of $30 \mu\text{m}$ from the most exterior surface". Accordingly, Applicants respectfully submit that the reference fails to disclose each and every element of the claimed invention.

In view of the foregoing, Applicants respectfully submit that the rejection of claim 4, as herein amended, under 35 U.S.C. 102(b) over Japanese document 07-157362, is without support and should be withdrawn.

**Rejection of Claims 4-7 under 35 U.S.C. 102(b) or, in the
Alternative Under 35 U.S.C. 103(a)**

Claims 4-7 have been rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Japanese document 07-157362. The Office Action states:

"The Japanese document teaches a sintered material having a dislocation structure of 1×10^4 to $9 \times 10^{14} \text{cm}^{-2}$, see table on page 4, however the document fails to teach the method of forming.

In product-by-process claims, "once a product appearing to be substantially identical is found and a 35 U.S.C. 102/103 rejection [is] made, the burden shifts to the applicant to show an unobvious difference." MPEP 2113. This rejection under 35 U.S.C. 102/103 is proper because the "patentability of a product does not depend on its method of production." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)."

Applicants respectfully traverse the rejection on the ground that the reference does not teach each and every claimed limitation of the amended claims.

As applicants have previously noted, the Federal Circuit has held that anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Those elements must either be inherent or expressly disclosed and must be arranged as in the claim. In re Bond, 15 USPQ2d 1566 (Fed. Cir. 1990). Additionally, there must be no difference between the claimed invention and the reference disclosed, as viewed by a person of

ordinary skill in the art. Richardson v. Suzuki Motor Co., 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The prior art reference must also be enabling, thereby placing the allegedly disclosed matter in the possession of the public. In re Brown, 329 F.2d 1006, 1011, 241 USPQ 245, 249 (C.C.P.A. 1964). In order to accomplish this, the reference must be so particular and definite that from it alone, without experiment or the exertion of his own inventive skill, any person versed in the art to which it pertains could construct and use it. Id. at 250.

Finally, the Federal Circuit has made it clear that a negative pregnant is not enough to show anticipation. Rowe v. Dror, 112 F.3d 473, 42 USPQ2d 1550 (Fed. Cir. 1997). Thus, where a reference does not explicitly describe anything inconsistent with a claimed use, if that reference nevertheless fails to make an affirmative suggestion of the claimed limitation, that reference cannot anticipate the claimed use. Id.

Even if the prior art device performs all the functions recited in the claim, the prior art cannot anticipate the claim if there is a structural difference. In re Robertson, 49 USPQ2d 1949, 1951 (Fed. Cir. 1999).

As noted above in the rejection of claim 4 under 35 U.S.C. 102(b), Japanese document 07-157362 discloses a dislocation density of 1×10^4 to $9 \times 10^{14} \text{cm}^{-2}$ not a "dislocation structure" as suggested by the examiner. The dislocation density is a measure

of how many dislocations are present in a quantity of a material, i.e., number of dislocations per unit volume. In contrast, the dislocation structure is the actual structure of the dislocations within the material. Applicants respectfully submit that the dislocation density is not an indicator of the dislocation structure and that different dislocation structures may have the same or similar dislocation density.

Applicants respectfully point out that, although the reference discloses a dislocation density of 1×10^4 to $9 \times 10^{14} \text{cm}^{-2}$, it fails to teach or suggest a dislocation structure corresponding to that claimed in the present invention, i.e., "a uniformly distributed linear dislocation structure in the sub-surface regions within depth direction of $30 \mu\text{m}$ from the most exterior surface". Accordingly, Applicants respectfully submit that the reference fails to disclose each and every element of the invention recited in claim 4.

Furthermore, Applicants respectfully submit that the claimed dislocation structure cannot be said to be inherent in the reference because the reference teaches a process which involves the application of high heat, i.e., 1300°C to 1400°C , to the ceramic product. Indeed, the process of the reference is described as hot-pressing in which the plastic deformation is conducted simultaneously with heating or annealing. Hot pressing is a different process than shot blasting in that with hot pressing force is applied simultaneously and consistently over

the entire surface of an article, whereas with shot blasting, the pressing force is applied at individual minute locations over the surface of the article by the high speed application of a plurality of abrasive particles. In that regard, the recited limitations of claims 5 and 6, as amended herein, are completely absent from the present reference as there is no disclosure or suggestion of the employment of a shot blasting process where the particles have a convexly curved surface and an average particle size of 0.1 μ m to 250 μ m with a Vickers hardness of 500 or more. Nor is there any disclosure or suggestion that such particles are directed to the ceramic product at a pressure of 0.1 to 0.5MPa at a speed of 20m/sec to 250m/sec for a time of 0.1sec/cm² to 60sec/cm².

In view of the foregoing, Applicants respectfully submit that the rejection of claims 4-6, as amended herein, as anticipated by Japanese document 07-157362 under 35 U.S.C. 102(b) is without support and should be withdrawn.

With regard to the alternative rejection under 35 U.S.C. 103(a), Applicants respectfully traverse the rejection on the ground that the reference teaches away from the present invention.

As previously noted, the Federal Circuit has held that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art

references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991; In re Fine, 5 USPQ2d 1596, 1596 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The examiner bears the initial burden of providing some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

The present application claims a ceramic product having a uniformly distributed linear dislocation structure in the sub-surface regions within a depth of 30 μ m from the surface and a dislocation density of from 1×10^8 to 9×10^{13} cm^{-2} . This structure is obtained by plastic working of the ceramic structure without annealing where the plastic working is carried out by shot blasting the ceramic with the abrasive particles at a pressure of 0.1 to 0.5MPa, a shot blasting speed of 20m/sec to 250m/sec and a shot blasting time of 0.1sec/ cm^2 to 60sec/ cm^2 .

As pointed out with respect to the rejection under 35 U.S.C. 102(b), Japanese document 07-157362 discloses a dislocation density of 1×10^4 to 9×10^{14} cm^{-2} not a "dislocation structure" as suggested by the examiner. The dislocation density is a measure of how many dislocations are present in a quantity of a material,

i.e., number of dislocations per unit volume. In contrast, the dislocation structure is the actual structure of the dislocations within the material. Applicants respectfully submit that the dislocation density is not an indicator of the dislocation structure and that different dislocation structures may have the same or similar dislocation density.

Applicants respectfully point out that, although the reference discloses a dislocation density of 1×10^4 to $9 \times 10^{14} \text{cm}^{-2}$, it fails to teach or suggest a dislocation structure corresponding to that claimed in the present invention, i.e., "a uniformly distributed linear dislocation structure in the sub-surface regions within depth direction of $30 \mu\text{m}$ from the most exterior surface". There is nothing in the reference to suggest that the ceramic product resulting from the hot-pressing process of the reference exhibits a uniformly distributed linear dislocation structure.

Furthermore, the reference completely fails to disclose or suggest the use of shot blasting as the means to achieve plastic deformation of the ceramic article. Instead, the reference specifically teaches a hot-pressing process in which uniform and consistent pressure is applied to the ceramic article simultaneously with heating at a temperature of 1300°C to 1400°C . Applicants respectfully point out that nothing in the cited reference teaches or suggests the production of a toughened ceramic product by plastic deformation alone without heat

treatment or annealing. The teaching of the reference is specific to a toughened ceramic product produced by a hot pressing process.

Absent some suggestion in the reference to apply shot blasting alone without heat and that such a process would yield the uniformly distributed linear dislocation structure of the present invention, Applicants respectfully submit that there is no motivation which would urge one of ordinary skill in the art to depart from that teaching and to modify the reference with any reasonable expectation of success.

In the absence of any such suggestion, Applicants respectfully submit that a *prima facie* case of obviousness of the present invention over the Japanese document 07-157362 has not been made and that the rejection of claims 4-6, as amended herein, is without support and should be withdrawn.

**Rejection of Claims 4-7 under 35 U.S.C. 102(b) or, in the
Alternative Under 35 U.S.C. 103(a)**

Claims 4-7 have been rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Japanese document 2001-181099. The Office Action states:

"The Japanese document teaches a ceramic article having dislocation sub-boundaries.

It is well settled that when a claimed composition appears to be substantially the same as a composition disclosed in the prior art, the burden is properly upon the applicant to prove by way of tangible evidence that

the prior art composition does not necessarily possess characteristics attributed to the CLAIMED composition. In re Spada, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Circ. 1990); In re Fitzgerald, 619 F.2d 67, 205 USPQ 594 (CCPA 1980); In re Swinehart, 439 F.2d 2109, 169 USPQ 226 (CCPA 1971).

Applicants respectfully traverse the rejection on the ground that the reference does not teach each and every claimed limitation of the amended claims.

As applicants have previously noted, the Federal Circuit has held that anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Those elements must either be inherent or expressly disclosed and must be arranged as in the claim. In re Bond, 15 USPQ2d 1566 (Fed. Cir. 1990). Additionally, there must be no difference between the claimed invention and the reference disclosed, as viewed by a person of ordinary skill in the art. Richardson v. Suzuki Motor Co., 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The prior art reference must also be enabling, thereby placing the allegedly disclosed matter in the possession of the public. In re Brown, 329 F.2d 1006, 1011, 241 USPQ 245, 249 (C.C.P.A. 1964). In order to accomplish this, the reference must be so particular and definite that from it alone, without experiment or the exertion of his own inventive skill, any person versed in the art to which it pertains could construct and use it. Id. at 250.

Finally, the Federal Circuit has made it clear that a negative pregnant is not enough to show anticipation. Rowe v. Dror, 112 F.3d 473, 42 USPQ2d 1550 (Fed. Cir. 1997). Thus, where a reference does not explicitly describe anything inconsistent with a claimed use, if that reference nevertheless fails to make an affirmative suggestion of the claimed limitation, that reference cannot anticipate the claimed use. Id.

Even if the prior art device performs all the functions recited in the claim, the prior art cannot anticipate the claim if there is a structural difference. In re Robertson, 49 USPQ2d 1949, 1951 (Fed. Cir. 1999).

Applicants respectfully point out that Japanese document 2001-181099 is directed to the introduction of dislocation sub-boundaries by striking minute impressions in the surface of a brittle crystalline material by means of an indenter, such as Vickers hardness tester, followed by annealing at between $0.5T_M$ and T_M where T_M is the absolute temperature of the melting point of the brittle material, in such a way that the impressions substantially disappear and dislocation sub-boundaries are introduced at the same time.

In this respect, the present reference is similar to the previously discussed reference of Saka, et al., in that the present reference is directed to a method of toughening and modifying ceramic which requires both plastic working and annealing to produce a final product. Applicants respectfully submit that the resulting structure of the present reference is

like that of Saka, et al. as shown in the present application in Fig. 3, and is characterized by a dislocation structure in the form of a network of dislocated cells which is then stabilized by the annealing step.

In contrast, the present application is directed to a surface toughened ceramic product which is produced by plastic working only and is characterized by a uniformly distributed linear dislocation structure in the sub-surface regions which is clearly shown in Fig. 2 of the present application. This linear dislocation structure is uniform to a depth of 30 μ m from the surface and has a density in the range of 1×10^8 to 9×10^{13} cm⁻².

As previously pointed out, the structural difference between the ceramic product of the present application and that of a similar product produced using by a process which combines plastic deformation and heat treatment as described by the present reference is specifically discussed in the present application at page 17, line 17 to page 18, line 2 (paragraph 42 in Pub. 2006/0293165).

"In Fig.2, especially from enlarged drawing (B), in the sub-surface regions of specimen treated by the present invention, linear dislocation structure that distributed homogeneously caused by the fact that the plastic deformation caused homogeneously can be observed. In the drawing, black linear line is dislocation, and at the surface of the product, block of black part which is formed by accumulating dislocation can be observed. In Fig.2, whity part can be observed at the surface of product, however, this is caused by not meeting of observation condition because the crystal of whity part is slightly rotated against the crystal of black part, and by adjusting the observation condition said part becomes black and the existing of dislocation can be confirmed. In the

meanwhile, according to Fig.3 of the transmission electron microscope picture of ceramics product to be treated using conventional technique, dislocation structure becomes a net work shape dislocated cell structure, which is a stabilized arrangement, by annealing treatment after plastic working. In this Figure, dislocation is accumulated at the black net work part and consequently dislocation density becomes high, and in white part is the range where dislocation does not exist. Since dislocation does not exist at this white part, it does not change color to black, even if the observation condition is changed. Thus, the structure obtained by the method for surface toughening of the present invention is remarkably different from the structure obtained by conventional technique."

Accordingly, as the present application clearly describes, the claimed ceramic product exhibits an homogenously distributed linear dislocation structure which is produced by plastic deformation using fine particles of abrasive having an average particle size of 0.1 μ m to 250 μ m, a convexly curved surface and a Vickers hardness of 500 or more. In addition, the claimed ceramic product is the result of plastic deformation only, without annealing, where the plastic working is carried out by shot blasting the ceramic with the abrasive particles at a pressure of 0.1 to 0.5MPa, a shot blasting speed of 20m/sec to 250m/sec and a shot blasting time of 0.1sec/cm² to 60sec/cm².

In contrast, the cited reference teaches a product which, due to its common production method with Saka, et al., would be expected to have a non-homogenously distributed, non-linear dislocation structure obtained by described combination of plastic deformation and heat treatment at a temperature of from 0.5T_M to T_M where T_M is the absolute temperature of the melting

point of the material. Applicants respectfully point out that nothing in the cited reference teaches or suggests the production of a toughened ceramic product having the uniformly distributed linear dislocation structure in the sub-surface regions by plastic deformation alone. The teaching is specific to a toughened ceramic product produced by a combination of plastic deformation and heat treatment in that order. As shown and described in the present application, the combined plastic deformation and heat treatment of the reference results in a ceramic structure having a different internal structure than that of the present invention.

In view of the foregoing, Applicants respectfully submit that the product of the present invention and the product of the reference are structurally different and this has been demonstrated by tangible evidence of record. Applicants therefore respectfully submit that the present invention is not disclosed by the Japanese document 2001-181099 and is not anticipated thereby. Accordingly, the rejection under 35 U.S.C. 102(b) should be withdrawn.

With regard to the alternative rejection under 35 U.S.C. 103(a), Applicants respectfully traverse the rejection on the ground that the reference teaches away from the present invention.

As previously noted, the Federal Circuit has held that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a

reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991; In re Fine, 5 USPQ2d 1596, 1596 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The examiner bears the initial burden of providing some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

The present application claims a ceramic product having a uniformly distributed linear dislocation structure in the sub-surface regions within a depth of 30 μ m from the surface and a dislocation density of from 1×10^8 to 9×10^{13} cm⁻². This structure is obtained by plastic working of the ceramic structure without annealing where the plastic working is carried out by shot blasting the ceramic with the abrasive particles at a pressure of 0.1 to 0.5MPa, a shot blasting speed of 20m/sec to 250m/sec and a shot blasting time of 0.1sec/cm² to 60sec/cm².

As pointed out in connection with the rejection under 35 U.S.C. 102(b), the reference teaches a product having a non-homogenously distributed, non-linear dislocation structure obtained by plastic deformation using an indenter followed by heat treatment at a temperature of from 0.5T_M to T_M, where T_M is

the absolute temperature of the melting point of the product. Applicants respectfully point out that nothing in the cited reference teaches or suggests the production of a toughened ceramic product by plastic deformation alone. The teaching of the reference is specific to a toughened product produced by a combination of plastic deformation and heat treatment in that order. As shown and described in the present application, the combined plastic deformation and heat treatment of the reference results in a ceramic structure having a different internal structure than that of the present invention.

Absent some suggestion in the reference to eliminate the annealing step and that elimination of that step would yield the uniformly distributed linear dislocation structure of the present invention, Applicants respectfully submit that there is no motivation which would urge one of ordinary skill in the art to depart from that teaching and to modify the reference with any reasonable expectation of success.

In the absence of any such suggestion, Applicants respectfully submit that a *prima facie* case of obviousness of the present invention over the Japanese document 2001-181099, has not been made and that the rejection of claims 4-6, as amended herein, is without support and should be withdrawn.

Rejection of Claims 4-7 under 35 U.S.C. 102(b) or, in the
Alternative Under 35 U.S.C. 103(a)

Claims 4-7 have been rejected under 35 U.S.C. 102(b) as

anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Japanese document 5-201783. The Office Action states:

"The Japanese document teaches ceramic articles that are subjected to shot-blasting.

It is well settled that when a claimed composition appears to be substantially the same as a composition disclosed in the prior art, the burden is properly upon the applicant to prove by way of tangible evidence that the prior art composition does not necessarily possess characteristics attributed to the CLAIMED composition. In re Spada, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Circ. 1990); In re Fitzgerald, 619 F.2d 67, 205 USPQ 594 (CCPA 1980); In re Swinehart, 439 F.2d 2109, 169 USPQ 226 (CCPA 1971).

Applicants respectfully traverse the rejection on the ground that the reference does not teach each and every claimed limitation of the amended claims.

As applicants have previously noted, the Federal Circuit has held that anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Those elements must either be inherent or expressly disclosed and must be arranged as in the claim. In re Bond, 15 USPQ2d 1566 (Fed. Cir. 1990). Additionally, there must be no difference between the claimed invention and the reference disclosed, as viewed by a person of ordinary skill in the art. Richardson v. Suzuki Motor Co., 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The prior art reference must also be enabling, thereby

placing the allegedly disclosed matter in the possession of the public. In re Brown, 329 F.2d 1006, 1011, 241 USPQ 245, 249 (C.C.P.A. 1964). In order to accomplish this, the reference must be so particular and definite that from it alone, without experiment or the exertion of his own inventive skill, any person versed in the art to which it pertains could construct and use it. Id. at 250.

Finally, the Federal Circuit has made it clear that a negative pregnant is not enough to show anticipation. Rowe v. Dror, 112 F.3d 473, 42 USPQ2d 1550 (Fed. Cir. 1997). Thus, where a reference does not explicitly describe anything inconsistent with a claimed use, if that reference nevertheless fails to make an affirmative suggestion of the claimed limitation, that reference cannot anticipate the claimed use. Id.

Even if the prior art device performs all the functions recited in the claim, the prior art cannot anticipate the claim if there is a structural difference. In re Robertson, 49 USPQ2d 1949, 1951 (Fed. Cir. 1999).

Considering the teaching of the reference it is seen that the disclosure thereof is directed to the surface treatment of a ceramic sintered compact which is for the purpose of removing surface discontinuities, i.e., honing, by means of a liquid or abrasive grain stream. Because of concern that impact of the honing stream may fracture the ceramic compact, the reference teaches heating the ceramic to a temperature at which the degree of hardness of the ceramic falls to 95% - 65% that of the room

temperature hardness during honing. The reference states in paragraph 8 that if the degree of hardness is higher than 95% of a room temperature hardness, fracture toughness hardly increases and, in fact, may decrease after the honing process, whereas if the hardness falls below 65%, the reinforcement at the time of honing falls and faults resulting from the blasting may arise. In view of the foregoing, the reference specifically teaches that the dry honing process is carried out with the ceramic compact heated to a temperature of from 500°C to 1200°C simultaneously with the blasting for maximum fracture resistance against the impact effects of the blast stream.

As Applicants have previously shown with respect to the Saka, et al., reference, the application of both shot blasting and heat treatment, i.e., annealing, results in a different dislocation structure within the sub-surface regions of the ceramic product. Accordingly, Applicants respectfully submit that the ceramic compact resulting from the treatment according to the teaching of Japanese document 05-201783 exhibits a structure that is different from the uniformly distributed linear dislocation structure of the present invention. Furthermore, Applicants respectfully point out that there is no teaching or suggestion in the present reference of the product exhibiting a dislocation density in the range of from 1×10^8 to $9 \times 10^{13} \text{ cm}^{-2}$ as recited in the present claims. Furthermore, the present invention, particularly as recited in claims 5 and 6 as herein amended is produced without a heating or annealing step, whether

simultaneous with or following the shot blasting, which is completely outside the scope of the teachings of the present reference.

In view of the foregoing, Applicants respectfully submit that the product of the present invention and the product of the reference are structurally different and this has been demonstrated by tangible evidence of record. Furthermore, the process of forming the respective products is different in that the product of the present invention is produced substantially at room temperature without a heating or annealing treatment, unlike the reference. Applicants therefore respectfully submit that the present invention is not disclosed by the Japanese document 05-301783 and is not anticipated thereby. Accordingly, the rejection under 35 U.S.C. 102(b) should be withdrawn.

With regard to the alternative rejection under 35 U.S.C. 103(a), Applicants respectfully traverse the rejection on the ground that the reference teaches away from the present invention.

As previously noted, the Federal Circuit has held that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991; In re Fine, 5 USPQ2d 1596, 1596 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The examiner bears the initial burden of providing some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

The present application claims a ceramic product having a uniformly distributed linear dislocation structure in the sub-surface regions within a depth of 30 μ m from the surface and a dislocation density of from 1×10^8 to 9×10^{13} cm⁻². This structure is obtained by plastic working of the ceramic structure without annealing where the plastic working is carried out by shot blasting the ceramic with the abrasive particles at a pressure of 0.1 to .05MPa, a shot blasting speed of 20m/sec to 250m/sec and a shot blasting time of 0.1sec/cm² to 60sec/cm².

As pointed out in connection with the rejection under 35 U.S.C. 102(b), the reference teaches a surface treatment of a ceramic sintered compact which is for the purpose of removing surface discontinuities, i.e., honing, by means of a liquid or abrasive grain stream. Because of concern that impact of the honing stream may fracture the ceramic compact, the reference specifically teaches heating the ceramic to a temperature at which the degree of hardness of the ceramic falls to 95% - 65% that of the room temperature hardness during honing. The reference states in paragraph 8 that if the degree of hardness is

higher than 95% of a room temperature hardness, fracture toughness hardly increases and, in fact, may decrease after the honing process, whereas if the hardness falls below 65%, the reinforcement at the time of honing falls and faults resulting from the blasting may arise. In view of the foregoing, the reference specifically teaches that the dry honing process is carried out with the ceramic compact heated to a temperature of from 500°C to 1200°C simultaneously with the blasting. There is no suggestion or teaching that the process be conducted or that the desired product can be produced without that heating requirement. Accordingly, there would be no motivation to one of ordinary skill in the art considering the teaching of the reference to eliminate the heating step with the expectation of achieving the desired result.

Furthermore, as Applicants have previously shown with respect to the Saka, et al., reference, the application of both shot blasting and heat treatment, i.e., annealing, results in a different dislocation structure within the sub-surface regions of the ceramic product. Accordingly, Applicants respectfully submit that it would be expected that the ceramic compact resulting from the treatment according to the teaching of Japanese document 05-201783 exhibits a structure that is different from the uniformly distributed linear dislocation structure of the present invention. Furthermore, Applicants respectfully point out that there is no teaching or suggestion in the present reference of the product produced thereby exhibiting a dislocation density in

the range of from 1×10^8 to 9×10^{13} cm^{-2} as recited in the present claims.

The teaching of the reference is specific to a toughened product produced by a combination of plastic deformation and heat treatment in that order. As shown and described in the present application, combined plastic deformation and heat treatment results in a ceramic structure having a different internal structure than that of the present invention.

Absent some suggestion in the reference to eliminate the annealing step and that elimination of that step would yield the uniformly distributed linear dislocation structure of the present invention, Applicants respectfully submit that there is no motivation which would urge one of ordinary skill in the art to depart from that teaching and to modify the reference with any reasonable expectation of success.

In the absence of any such suggestion, Applicants respectfully submit that a *prima facie* case of obviousness of the present invention over the Japanese document 05-201783, has not been made and that the rejection of claims 4-6, as amended herein, is without support and should be withdrawn.

Double Patenting

Claims 4-7 have been provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 5, 6 of copending Application No. 10/599,604. Although the conflicting claims are not identical,

they are not patentably distinct from each other because the scope of the copending claims overlap.

Claims 4-7 have been provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claim 5 of copending Application No. 10/553,849. Although the conflicting claims are not identical, they are not patentably distinct from each other because the scope of the copending claims overlap.

The Office Action states:

"The copending claims and the claims differ in that they do not teach the exact same article as recited in the instant claims.

However, one of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the ranges taught by copending application overlap the instantly claimed ranges and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

'The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages',
In re Peterson 65 USPQ2d 1379 (CAFC 2003).

Also, In re Geisler 43 USPQ2d 1365 (Fed Cir. 1997); In re Woodruff, 16 USPQ2d 1934 (CCPA 1976); In re Malagari, 182 USPQ 549, 553 (CCPA 1974) and MPEP 2144.05."

Applicants respectfully submit that the present application is not the proper venue for the present rejection or for terminal disclaimers inasmuch as the present application is the first

filed.

Since the doctrine of double patenting seeks to prevent the unjustified extension of the exclusivity that is granted by a patent beyond the statutory term authorized by Congress, double patenting is considered to result when the right to exclude granted by a first patent is unjustly extended by the grant of a later issued patent or patents. However, this doctrine was established at a time when the term of a patent was calculated from its actual date of issuance, not, as now, when the term is calculated from the earliest effective U.S. filing date.

The effect of a terminal disclaimer is to disclaim that portion of a patent term which extends beyond the expiration of at least one other patent having claims that are not patentably distinct and which has at least one common inventor and/or common assignee or owner, or, where not commonly owned or assigned, is subject to a joint research agreement. Since the term of a patent is 20 years calculated from the earliest effective U.S. filing date, Applicants respectfully submit that the present double patenting rejection and requirement for a terminal disclaimer should more properly be made in the later filed co-pending applications 10/553,849 and 10/599,604, not in the present application.

In that regard, Applicants respectfully point out that the present application is the U.S. national phase of international application PCT/JP03/13718, having an international filing date of October 15, 2003. Its U.S. filing date is April 5, 2005. In

contrast, cited co-pending application S.N. 10/533,849 is the U.S. national phase of International Application PCT/JP04/07042, having an international filing date of May 18, 2004, and a U.S. filing date of October 24, 2005. Accordingly, the effective filing date of the present application is prior to that of the cited application such that any patent issuing from the present application will necessarily expire prior to any patent which may issue from the cited co-pending application S.N. 10/533,849.

Similarly, although the undersigned does not have access to the cited application S.N. 10/599,604, in view of the later serial number, it is respectfully submitted that the effective filing date of S.N. 10/599,604 is also later than that of the present application such that any patent to issue from the present application will necessarily expire prior to any patent which may issue from the later filed co-pending application.

In view of the foregoing, Applications respectfully submit that, since the present application is the earliest filed of the applications addressed by the examiner in the double patenting rejection, the present application is not the proper venue for such a rejection or for terminal disclaimers to the later filed applications.

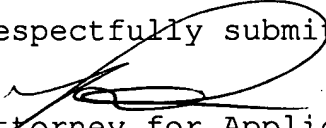
Applicants therefore respectfully submit that the double patenting rejection in the present application should be withdrawn from the present application and, if such rejection is deemed necessary, that it be made in the later filed co-pending applications S.N. 10/533,849 and S.N. 10/599,604.

Conclusion

In view of the foregoing, Applicants respectfully submit that the examiner's rejections have been overcome and that the claims as presented herein are allowable over the prior art.

An early notification of allowance is earnestly solicited.

Respectfully submitted,



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